TS-Platform,
Recent Considerations about Moving

J.Lühning, 24.Aug.2010

Air pads

What do we need in case we decide to choose air pads for moving the platform? At the moment we consider that the total weight of the target spectrometer will be up to 340 tons (without Muon Filter). The air pads sold by DELU/Nuremberg have a capacity of 40 tons each. Maybe they can be overloaded a little bit but that would possibly cause problems. In order to avoid such problems we would need at least 9 pads of this type.

The Finnish company Solving (see *http://www.solving.com/en/gallery/5977ee58ae458ce28361b6389102f36534895cda*) offers air pads with a capacity of 60 tons. These pads are quadratic (150_cm) like the DELU pads (122_cm) and operate with 4 bars. We would need 6 of them. The price (with pressure controller) is less than 150_EUR/ton. The air consumption of 6 big Solving pads and 9 DELU-pads are more or less the same: we would need about 18 normal cubic meters per minute (safety factor 1.5 included). It is not clear whether we could get that much air - and it must be relatively clean - from a remote, common indoor supply. If not we would have to buy or rent a compressor. The price for a new machine of this capacity is in the order of 50000_EUR. Used ones are cheaper, for instance 32000_EUR for this 3-year-old compressor:

http://en.bau-portal.com/verkauf/_283_60075807.php .

Renting a compressor costs about 2000_EUR per week. The space required for the compressor is about 3_m width, 2_m depth, 2.5_m height.

My personal opinion: I still do not find the air pad solution very attractive, looking only at the supply they need.

Hilman Rollers

I have asked Hilman people about the friction coefficient of their rollers. They said it is nearly constant all over the path, it does not depend on the position of individual rolls.

Asked what would happen if one roller would be accidentally overloaded they said that this has to be avoided. So, if we decide to use rollers, I guess we have to choose 4 ones with a capacity of 150 tons, for instance the 150-XOTL type.

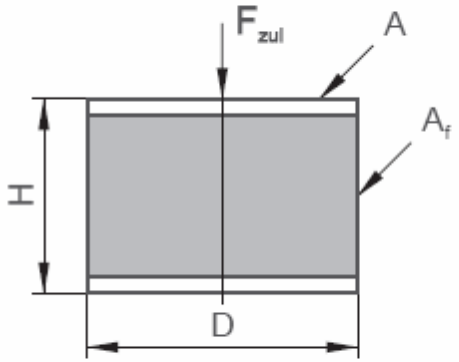
Hilman offers elastomeric pads (see under Tab “Pads” on http://www.hilmanrollers.com/Products/Options%20and%20Modifications/indexOptions.html) for, I cite, “allowing the movement of heavy loads over less than a perfect floor surface”.

What is their spring constant? They are 25_mm thick, and from the information I have found under http://www.sd-dresden.de I guess that the Young’s modulus (german Elastizitätsmodul, see next page) is about 500 MPa (with a form factor [ratio loaded surface / unloaded surface] of about 12). With a load of 100 tons the pad will be compressed by about 0.3_mm only.

We probably have to provide more elasticity by other measures.

Calculation Rubber Pads (from www.sd-dresden.de)

Die folgenden Berechnungsgrundlagen führen zu Ergebnissen mit hinreichender Genauigkeit und haben Gültigkeit bis zu einem max. Federweg von 0,20 x H (20% der Pufferhöhe).



$$F_{zul} = \frac{f \times A \times Ec}{H}$$

Das Elastizitätsmodul Ec ist vom Formfaktor k abhängig (siehe Diagramm).

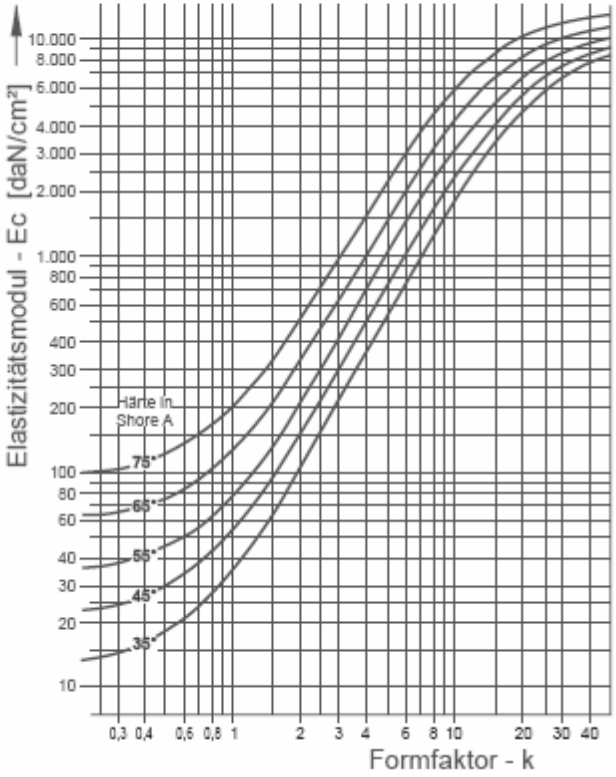
$$k = \frac{2 \times A}{A_f} \qquad \frac{\text{Aktionsfläche}}{\text{freie Fläche}}$$

$$k = \frac{D}{2 \times H} \qquad \text{bei Rundpuffern}$$

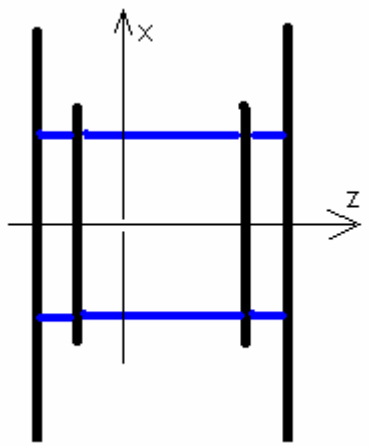
$$k = \frac{2 \times L \times B}{H \times (L + B)} \qquad \text{bei Rechteckpuffern}$$

$$A = \frac{\pi}{4} \times D^2 \qquad \text{(Rundpuffer)}$$

F_{zul} - zulässige Kraft [daN]
A - Aktionsfläche [cm²]
A_f - freie Fläche (Mantelfläche Gummi) [cm²]
H - Gummihöhe [cm]
f - Federweg [cm]
Ec - Elastizitätsmodul [daN/cm²]
k - Formfaktor [-]
D - Durchmesser [cm]



Beams for support structure



The support structure Edward thinks of and the one I think of have in common that they consist of 4 parallel beams that show in x-direction. The inner ones, which are nearly 9_m long in Edward's design (6_m in my layout), support the barrel, the outer ones, which are about 9_m long, support the doors. The upper dimension of the inner beams is given by the lower dimension of the barrel support structure (y=-2650mm defined by DUBNA).

The requirements for the outer beams still have to be defined according to the layout of the rails provided for opening the doors. Probably 2 rails in parallel will be used.

What is the distance between the rails, or what is the width of the I-beam?

Is the top flange of an I-beam sufficient for the rails (high load on the relatively thin girder, see right figure)? Is a box section (rectangular tube) more convenient?